Sandia National Laboratories
Waste Isolation Pilot Plant

Analysis Plan
for

Upgrade of Operating System to OpenVMS 7.3-1 and Hardware to HP Alpha ES45

AP-089, Revision 0
WIPP 1.3.5.2.1

Effective Date: 09/11/02

Authored by:	Rodger E. Coman	*Original signed by Rodger E. Coman*	*9/9/2002*
	Print Name	Signature	Date
	Principal Investigator		
Reviewed by:	Jianjun Lin	*Original signed by Jianjun Lin*	*9/9/2002*
	Print Name	Signature	Date
	Technical Reviewer		
Approved by:	M. Kathryn Knowles	*Original signed by M.K. Knowles*	*Sep/11/2002*
	Print Name	Signature	Date
	Department Manager		
QA Review:	Mario J. Chavez	*Original signed by Mario Chavez*	*9/11/2002*
	Print Name	Signature	Date
	Quality Assurance Reviewer		

TABLE OF CONTENTS

1.0 INTRODUCTION and SCOPE

This document details a “regression test” for the operating system (OS) upgrade to OpenVMS 7.3-1 and the addition of new hardware, Compaq ES45 system, for the WIPP Regulatory Compliance Department COMPAQ Alpha Cluster. This cluster is currently running OpenVMS 7.2-1. Change Control documentation will be generated in accordance with Quality Assurance Procedure (QAP) NP 19-1, revision 9. A separate analysis report will be prepared for the OS upgrade and the Hardware upgrade.

The purpose of this test is to demonstrate that upgrading the OpenVMS operating system software to Version 7.3-1 will have no significant undesirable effects on the WIPP PA application software. Additionally, the hardware upgrade test will demonstrate there is no significant undesirable affects on the WIPP PA application software resulting from the addition of ES45 hardware. Portions of this test will also serve as the installation and checkout for the specific versions of the application software identified in Section 2.1 of this document.

Previous OS regression tests of the COMPAQ Alpha Cluster have been preformed by comparing test results on the “new” OS against the previous OS regression test results. The OpenVMS 7.3-1 and ES45 regression tests will be compared (where possible) against tests conducted on OpenVMS 6.1. The reason for this change in test procedure is to demonstrate that the test results are consistent with the results obtained under the same OS version that was used for CCA [1] and PAVT [2] calculations.

This test focuses solely on the effect of the upgrades on the WIPP PA application software. It does not address other system related issues such as possible effects on the system backup and archiving software and the Configuration Management System.

1.1 PARTICIPATING PERSONNEL

Document Author	Rodger E. Coman	6821	845-8529
Technical Reviewer	Jianjun Lin	6821	844-2758
QA Coordinator	Mario J. Chavez	6820	234-0188
SCM Coordinator	Rodger Coman	6820	234-0122
COMPAQ Alpha Systems Manager	John Geilow	6821	284-3946
Lead Software Tester	Rodger Coman	6821	845-8529/234-0122
Software Tester	Jennifer Long	6821	844-1541
Lead Application Code Analyst	Cliff Hansen	6821	845-0285
Application Code Analyst	Josh Stein	6821	284-0936
Application Code Analyst	Amy Gilkey	6821	299-1282
Application Code Analyst	James Garner	6821	284-2761
Test Lead/SCMS Auditor/Librarian	Mike Williamson	6848	844-3792
Department Manager	M. Kathryn Knowles	6821	284-2727

1.2 TRAINING REQUIREMENTS

There are no special training requirements for this testing. All participants, listed above, are already fully trained and will be functioning within their normal job descriptions.

1.3 ESTIMATED SCHEDULE

The testing described in this document will adhere to the following estimated schedule:

1. Receipt of New ES45 04/30/02
2. Site preparation for ES45 Complete 07/23/02
3. Begin Modifying Test Scripts/Prepare CMS 08/29/02
4. Installation of OS 7.3-1 Complete 09/08/02
5. Test Scripts Complete 09/20/02 (Modify scripts as we proceed)
6. Begin Testing OpenVMS 7.3-1 09/11/02
7. Complete Testing OpenVMS 7.3-1 10/01/02
8. Begin Analysis of 7.3-1 OS Test Results 09/12/02
9. Complete Analysis Package for OS 7.3-1 10/04/02
10. Submit Analysis Package for OS 7.3-1 10/11/02
11. Alpha Cluster (less ES45) Operational 10/11/02 (Formal PA may resume)
12. Complete ES45 Installation/Final Setup 09/23/02
13. Preparation of ES45 for Testing 09/27/02
14. Begin Testing ES45 10/04/02 (Modify scripts as we proceed)
15. Complete Testing ES45 10/18/02
16. Begin Analysis of ES45 Test Results 10/07/02
17. Complete Analysis Package for ES45 10/25/02
18. Submit Final Analysis Package 11/30/02

2.0 COMPAQ ALPHA CLUSTER OVERVIEW

The COMPAQ Alpha Cluster is the main calculational platform for the WIPP Regulatory Compliance Department. The performance assessment calculations for the Compliance Certification Application (CCA) (see reference [1]) were performed on the platform in 1996, and more recently, the PA Verification Test (PAVT) (see reference [2]) for the Environmental Protection Agency were performed on this platform in 1997.

The cluster currently consists of 3 COMPAQ Alpha 2100 computers, and a single COMPAQ Alpha ES40, all of which currently run Version 7.2-1 of the OpenVMS operating system. The older 2100 COMPAQ Alpha computers are candidates for retirement and may not be in the cluster at the time of the actual test. Retirement of any or all of the current 2100 computers will have no impact on the tests identified in the plan. The COMPAQ Alpha ES45 will be considered a part of the cluster upon successful completion of this regression test.

The OS upgrade is needed as the majority of the WIPP PA application software executes on the OpenVMS version 7.2-1 that will no longer be supported by Compaq Computer Corporation. (Further more, installation of the ES45 hardware requires OpenVMS 7.3). By combining the upgrade to OpenVMS 7.3-1 and the new ES45 hardware installation the intention is to minimize complications in the installation and maintenance of both software and hardware. Comparison against the test results generated under the OpenVMS 6.1 are recommended in those cases where OpenVMS 6.1 test results exist.

2.1 WIPP PA APPLICATION SOFTWARE

The WIPP application software listed in Table 2-1 and Table 2-2 will be used for the testing described in Section 3. This list of codes was taken from the SNL WIPP BASELINE SOFTWARE LIST (reference [3]) and constitutes the latest versions of the WIPP application software, both PA and Non-PA, currently qualified on the COMPAQ Alpha Open VMS 7.2-1 platform. It is intended that the testing conducted under Test #1, Section 3.1, will constitute an Installation and Checkout for this software, to qualify it for use on the VMS 7.3-1 platform if the test is successful. Test #3, Section 3.4, will constitute an Installation and Checkout for this software, to qualify it for use on the new ES45 platform running OpenVMS 7.3-1 if the test is successful. Note that SECO, both Flow and Transport, are not included on the test list as they are not expected to be used in any future performance assessments. If it becomes necessary to use these codes, they will be tested in the future under a different Analysis Plan.

Table 2-1: Code list for Test #1 and #3

Code Name	Version	Executable Name	SPR Number*
ALGEBRACDB	2.35	ALGEBRACDB_PA96.EXE	
BLOTCDB	1.37	BLOTCDB_PA96.EXE	
BRAGFLO	4.10.02	BRAGFLO_QA0410B.EXE	01-002
CCDFGF	3.01	CCDFGF_QA0301.EXE	
CCDFSUM	2.01	CCDFSUM_QA0201.EXE	
CUTTINGS_S	5.04A	CUSP_QA0504A.EXE	
EPAUNI	1.14	EPAUNI_PA96_2.EXE	
GENMESH	6.08	GM_PA96.EXE	
GROPECDB	2.12	GROPECDB_PA96.EXE	
ICSET	2.22	ICSET_PA96.EXE	
LHS	2.41	LHS_PA96_2.EXE	
MATSET	9.10	MATSET_QA0910.EXE	
NUTS	2.05A	NUTS_QA0205A.EXE	99-001
PANEL	4.00	PANEL_QB0400.EXE	
POSTBRAG	4.00	POSTBRAG_PA96.EXE	
POSTEPAUNI	1.15	POST_EPAUNI_QA0115.EXE	
POSTLHS	4.07	POSTLHS_PA96.EXE	
PREBRAG	6.00	PREBRAG_PA96.EXE	01-002

PRELHS	2.30	PRELHS_QA0230.EXE	
RELATE	1.43	RELATE_PA96.EXE	
SPLAT	1.02	SPLAT_PA96_2.EXE	
STEPWISE	2.21	STEPWISE_PA96.EXE	
SUMMARIZE	2.20	SUMMARIZE_QA0220.EXE	97-016

*(SPR) Software Problem Report descriptions for those codes with active are included as Appendix A.

2.2 APPLICATION SOFTWARE LIBRARIES

The software libraries listed in Table 2-2, also taken from the SNL WIPP BASELINE SOFTWARE LIST (reference [3]), are necessary to the building of the code executables and will be exercised during testing. The test will constitute an Installation and Checkout for the software if the test is successful.

Table 2-2: Code list for Test #2 and #4

Library Name	Version
CAMCON_LIB	2.19
CAMDAT_LIB	1.24
CAMSUPES_LIB	2.21
PLT_LIB	2.03
SDBREAD_LIB	3.01

3.0 TEST DESCRIPTION

The OS version and hardware upgrade test will consist of the four tests detailed in this section.

The **OS version upgrade test** will consist of the first two tests (Test #1 and Test #2), described in sections 3.1 and 3.2. Each test will be conducted on a specific "testbed" machine set up by the Compaq Alpha Systems Manager. The "testbed" machine will be an ES40 system known as BTO. The ES40 is a four-processor Alpha machine and a member of the cluster.

The OpenVMS Version 7.3-1 operating system will be installed on the cluster as required. All of the tests for OpenVMS 7.3-1 will be run on BTO. For those tests that require comparison against the results of previous runs, that comparison will be made against results generated under OpenVMS 6.1(if they exist). In the event that regression test results are not available from OpenVMS 6.1 the analyst will determine what existing results can be used for the comparison. Any comparison against results other than those generated under OpenVMS 6.1 will be clearly identified in the analysis report. All executables, test inputs, test scripts, test outputs and test

results will be submitted for storage in CMS by the SCMS Librarian and reside in VMS73 class of the individual code libraries. All test related input files will be fetched at run time and test outputs/results will be submitted to CMS and placed into class VMS73 as part of the run script automatically.

The **hardware upgrade test** will consist of two test cases (Test #3 and Test #4), described in the sections 3.3 and 3.4. The ES45 will be set up by the COMPAQ Alpha System Manager for this test. The testing will be conducted on the ES45 while it is configured as a member of the OpenVMS 7.3-1 cluster. All test related files will be dynamically fetched at run time and test outputs/results will be automatically submitted to CMS and placed into class ES45 as part of the run script.

An Analysis Report will be prepared upon completion of Test #1 and #2. The ES45 tests may proceed in parallel with the OpenVMS 7.3-1 analysis effort. Should the test results for the OpenVMS 7.3-1 upgrade prove acceptable and the upgrade be approved for use, the OpenVMS Cluster will be considered operational and may be used for formal PA calculations while the ES45 tests are being conducted provided that the ES45 is not used for any of those calculations until the ES45 is also approved for use.

An Analysis Report will be prepared upon completion of Test #3 and #4 and appended to the report from the OpenVMS 7.3-1 upgrade.

The lead software tester will verify test selection, prepare scripts and libraries, and facilitate the tests. The software tester will execute tests. The test lead may modify any test script or re-execute any test to meet technical and/or quality requirements.

3.1 TEST #1

3.1.1 Test Objective

This test will run all of the "test cases" identified by consulting the "Requirements Coverage by Test Case" table defined in RD/VVP document for each of the application codes listed in Table 2-1. Each of the runs will be made on the OpenVMS 7.3-1 system. This will be done using the currently qualified executable (unrecompiled) from the OpenVMS 7.2-1 platform. The objectives of this test are to demonstrate that the code executables, as currently qualified on the OpenVMS 7.2-1 platform, will run correctly on the new OS without recompilation. An additional purpose of the test is to demonstrate that the test results are equivalent to test results obtained under OpenVMS 6.1 (when available, if tested under OpenVMS 6.1). Test results for codes run under OpenVMS 6.1 have been captured in their respective Validation Documentation for each baseline. Due to modification (i.e. SDBREAD_LIB) some codes (i.e., MATSET and PRELHS) will not have applicable test results from OpenVMS 6.1. In those cases the analyst will determine what OS version test results to use for comparison. If any of the codes fail in meeting this objective, that code will undergo recompilation and a complete regression test in order to qualify them for use.

3.1.2 Test Procedure

The following steps will be performed prior to and during the test:

- Identify the test cases from VVP for each code.
- Verify access to the executable as well as the input and output files for the test case(s). If files have been archived or out swapped the testing lead will work with the cluster system manager to restore the files.
- Update the test scripts to provide the ability to fetch the code executable at least once and all inputs at runtime, and place any relevant outputs into the VMS73 class under CMS prior to terminating the run script.
- Run the test cases on the testbed machine.
- Compare the output files generated on the testbed machine with the results from OpenVMS 6.1 test (if available for 6.1) using either the OpenVMS or CMS *difference* command. If possible this process should be automated as part of the test run script. Additionally, if electronic test results do not exist (code revisions not tested under 6.1), a visual comparison will be made using test results from written results on record.
- If OpenVMS 6.1 test results are not available, the analyst will determine what test results will be used for comparison.
- Evaluate the difference output files for conformance to the acceptance criteria. Differences not meeting the acceptance criteria will be examined for significance by an independent reviewer, the code team/sponsor, and the software tester.

It is known that some PA code executables are not able to execute using the current Fortran Run Time Library (RTL). If the code executables fail to run due to RTL related issues, those codes are allowed to use a previous version of the Fortran RTL. Any use of previous RTL's will be clearly identified in the analysis report. Any code qualified using a previous RTL will be considered qualified (under this plan) only when run in conjunction with that RTL.

- Any codes unable to execute will become subject to the following procedure:

    1. Rebuild the codes on the new OS platform.
    2. Execute all test cases on the new OS platform.
    3. Identify them in the Analysis Package as having required a rebuild.

- If problems arise that are attributed to the OpenVMS 7.3-1 OS, then:

    1. Report problems using the NWMP NP 19-1 process.
    2. Identify the problem(s) in the Analysis Package.
    3. Evaluation of the problem(s) by the SCMS Auditor/Librarian.
    4. Identity the appropriate remediation.
    5. Retest the affected codes.

3.1.3 Acceptance Criteria

It is expected that some differences will exist between the two sets of output files. The following types of differences are expected and considered to be trivial:

- Differences due to run dates and times.
- Differences due to different file names.
- Differences due to different directory names.
- Differences due to different user names.
- Differences due to platform and system version numbers.
- Minor numerical differences (defined by the analyst case by case and addressed in the analysis package).

Any code failing to meet the acceptance criteria will be identified, and the problem causing the failure identified and resolved by the code team/sponsor. The code will then be fully tested on the new platform.

3.2 TEST #2

3.2.1 Test Objective

This test consists of recompiling and then running all test cases for the five WIPP PA application software libraries listed in Table 2-2 on the OpenVMS 7.3-1 testbed. The purpose of the test is to verify that the libraries function as expected. The existing binary files (executables and object libraries) for the libraries will not be used for the test because any code that is "built" on this platform in the future will be built from the ground up and require library files built on this platform. This test constitute as an installation and checkout test for these five libraries on the OpenVMS 7.3-1 platform.

3.2.2 Test Procedure

The SCMS Librarian will be responsible for building the five libraries and the lead software tester for modifying test scripts and executing the test cases. The test procedure follows:

- Build the five libraries on the OpenVMS 7.3-1 platform.
- Modify test scripts as needed to so that all test inputs are fetched from CMS, and all test results are placed into CMS automatically.
- Execute all test cases for the five libraries as defined in the corresponding RD/VVP's.
- Compare the test output files with the results of the OpenVMS 6.1 test (if available). If the OpenVMS 6.1 test results are not available (i.e. SDBREAD_LIB), the analyst will determine

what test results will be used for comparison. The comparison will be made by script using either the OpenVMS or CMS *difference* utility.
- Check the differences against the acceptance criteria.
- Save the object libraries (OLB's), test driver executables, and output files in CMS under class VMS73. All relevant source files will be inserted into class VMS73.
- If a library fails to meet the acceptance criteria, the following steps will be taken:

1. Document the failure using the SPR process defined in NP 19-1 and include the problem(s) in the Analysis Package.
2. Investigate, identify, and correct the problem(s) by the code team/sponsor.

If such a failure occurs, it would have no direct effect on the existing executables used in Test Case #1, because the libraries are "linked" into the code executable at build time and the existing executables are not rebuilt on the new platform as part of this plan. However, any code that is rebuilt in the future on the new platform will have the potential for being effected by the changes to the library. Additionally, any code that is rebuilt will undergo full regression testing according to NP 19-1 and any effects would be discovered at that time.

3.2.3 Acceptance Criteria

There will be some differences between the two sets of output files. The following types of differences are expected and are completely acceptable:

- Differences due to run dates and times
- Differences due to different file names
- Differences due to different directory names
- Differences due to different user names
- Differences due to platform and system version.
- Minor numerical differences (defined by the analyst case by case and addressed in the analysis package).

.

3.3 TEST #3

3.3.1 Test Objective

This test will run all of the "test cases" identified by consulting the "Requirements Coverage by Test Case" table defined in RD/VVP document for each of the application codes listed in Table 2-1 on the ES45 system operating with the OpenVMS 7.3-1 OS. The purpose of this test is to demonstrate that the current versions of code executables will run correctly on the ES45 without recompilation. It is desirable that codes do not require recompilation. Any code that requires recompilation must undergo another complete regression test in order to qualify it for use. The

regression tests will serve as the Installation and Checkout test for each of the listed codes, which meet the acceptance criteria (3.3.3).

3.3.2 Test Procedure

The following steps will be performed prior to and during the test:

- Examine the RD/VVP and identify the subset of the test cases for each code.
- Verify access to the executable as well as the input and output files for the test case(s). If files have been archived or out swapped the testing lead will work with the cluster system manager to restore the files.
- All tests will be conducted on a disk directly connected to the ES45. The disk prepared for this test is **PATEST**.
- Modify existing test scripts as needed to insure that all inputs are fetched directly from CMS at run time and that all relevant outputs and difference files are placed in CMS (in class ES45) automatically.
- Modify existing test script so that each executable is shown (via logs) to be fetched from CMS at least once during testing.
- Execute the test case(s) on the test machine.
- If test case fails due to an RTL error, fetch EVAL_CCA_MASTER_FORRTLV73.COM from LIBWP and run at the $prompt (or as part of a batch job) in order to establish a logical pointer to the previous Fortran RTL, and rerun the test. Any use of previous RTL's will be clearly identified in the analysis report. Any code qualified using a previous RTL will be considered qualified (under this plan) only when run in conjunction with that RTL. See SPR 01-002 for details (Appendix A).
- Compare the output files generated on the test machine with those from previous test results (OpenVMS 7.3-1). The difference between the ES45 and previous test results generated by extracting the previous test results from CMS and running a difference command, or by using the CMS "*difference*" command.
- Evaluate the generated *difference* output file for conformance to the acceptance criteria. The software tester and the lead code team/sponsor will resolve any differences that do not meet the acceptance criteria.
- If any of the codes are unable to meet the acceptance criteria, then the following steps will be taken:

    1. Report problems using the NWMP NP 19-1 process.
    2. Identify the codes in the Analysis Package as having failed the test.
    3. Rebuild the codes on the new ES45 platform.
    4. Run a full regression test on the new ES45 platform in order to re-qualify them.

- If problems arise that are attributed to the ES45 platform then:

1. Document the failure using the SPR process defined in NP 19-1 and include the problem(s) in the Analysis Package.
2. Evaluation of the problem by the SCMS Auditor/Librarian.
3. Identify and apply the appropriate remediation.
4. Retest the affected code(s).

3.3.3 Acceptance Criteria

There will be some differences between the two sets of output files. The following types of differences are expected and are completely acceptable:

- Differences due to run dates and times
- Differences due to different file names
- Differences due to different directory names
- Differences due to different user names
- Differences due to platform and system version.
- Minor numerical differences (defined by the analyst case by case and addressed in the analysis package). Additionally, these will be documented using the SPR process defined in NP 19-1.

The *difference* output files as well as the conclusions drawn from the evaluation of difference results will be documented in the analysis package for this analysis plan. The Technical Reviewer will examine these listings and evaluations to verify that the acceptance criteria have been satisfied. Any code that fails to meet the acceptance criteria will be identified in the analysis package and subsequently, the problem that caused the failure will be identified and resolved by the code team/sponsor, and the code will be fully retested on the new platform.

3.4 TEST #4

3.4.1 Test Objective

The objective of this test is to verify that the libraries listed in Table 2-2 function as expected on the new platform. This test will constitute as an installation and checkout of these five libraries on the ES45.

3.4.2 Test Procedure

This test consists of recompiling and running specified test cases for the five WIPP PA application software libraries listed in Table 2-2 on the ES45 system. The procedure is as follows:

- Build the five libraries executables by the SCMS Librarian on the ES45 system using the OpenVMS 7.3-1 operating system.

- Execute the test cases for the five libraries as defined in the corresponding RD/VVP's.
- Compare the output files generated on the ES45 platform with those from the OpenVMS 7.3-1 regression tests using either the OpenVMS or CMS *difference* command.
- Check the differences against the acceptance criteria.
- Save the object libraries (OLB's), test driver executables, and output files in CMS under class ES45. All relevant source files will be inserted into class ES45.
- If a library fails to meet the acceptance criteria for one or more of its test cases, the following steps will be taken:

    1. Document the failure using the SPR process defined in NP 19-1 and include the problem(s) in the Analysis Package.
    2. Investigate, identify, and correct the problem(s) by the code team/sponsor

The *difference* output files as well as the conclusions from the tests will be documented in the Analysis Package for this analysis plan. The Technical Reviewer will examine these listings to verify that the acceptance criteria have been satisfied.

If such a failure occurs, it would have no effect on the existing executables used in Test #3, because the libraries are "linked" at build time and the existing executables are not rebuilt on the new platform. However, any code that is rebuilt in the future on the new platform will have the potential for being effected by the changes to the library. Additionally, any code that is rebuilt will undergo full regression testing according to NP 19-1 and any effects would be discovered at that time.

3.4.3 Acceptance Criteria

There will be some differences between the two sets of output files. The following types of differences are expected and are completely acceptable:

- Differences due to run dates and times
- Differences due to different file names
- Differences due to different directory names
- Differences due to different user names
- Differences due to platform and system version.
- Minor numerical differences.

4.0 OVERALL ACCEPTANCE CRITERIA

The purpose of the testing described in this document is to evaluate the OpenVMS 7.3-1 upgrade and the addition of the COMPAQ Alpha ES45 impact on the WIPP PA application software. It is expected that such effects will be very minor, especially for the addition of COMPAQ Alpha ES45. All test cases listed in the RD/VVP will be run (for identified codes) for Test #1 and #2 and the results from those tests will provide the basis for this evaluation. For the ES45 upgrade regression test, all test cases defined in the RD/VVP will be run.

If any code does not meet the acceptance criteria specified in this plan, then it fails the I&C and will undergo full testing after the problem has been resolved, in order to validate it for use on the new platform.

The decision as to whether to go ahead with the operating system and hardware upgrade for the cluster will be a judgment based upon the number and severity of problems encountered by this testing. The following will be the guidelines for this decision:

1. The codes in **Test #1 and #3** should satisfy the acceptance criteria described in the sections 3.1.3 and 3.3.3, and therefore pass the I&C.
2. The test of the five libraries in **Test #2 and #4** should meet the specified acceptance criteria described in the sections 3.2.3 and 3.4.3, and therefore pass the I&C.

5.0 REFERENCES

1. WIPP Performance Assessment; Traceability/Reproductabilty of the PA96 Compliance Certification Application, August 1996, WPO 40313.
2. SNL Fulfillment of the EPA-Mandated Performance Assessment Verification Calculation, August 1997, ERMS # 246854.
3. SNL WIPP Baseline Software List, ERMS # 248640.

APPENDIX A – SPR Descriptions

Code	Version	Date	Classification	SPR
BRAGFLO	4.10/4.10.02	1/13/2002	Developed	01-002

Minor - PREBRAG version 6.00 generates formated output that serves as input files for BRAGFLO. BRAGFLO uses an outdated list directed I/O standard that allow for space padded fields. When the VMS operating system was upgraded from version 6.x to 7.1 BRAGFLO could not read in certain fields from the PREBRAG generated input files because of extra spaces. The VMS 7.1 I/O standard only allows for 0 padded fields. The script EVAL_BF2_CONVERT_INPUT.COM (written by Mike Williamson) located in CMS Library LIBEVAL removes the spaces so that BRAGFLO can read the input files.

NUTS	2.05A	5/30/1997	Developed	99-001

Minor - Qualitative acceptance was used for functional requirement R9B, the implicit precipitation model. Analytical solutions under development will be completed, documented, reviewed and implimented using cmall codes. The documentation will be added to the VVP and VD. Mike Lord/Richard Anderson.

PREBRAG	6.00 *	2/6/1996	Developed	01-002

Minor - PREGRAG version 6.00 generates formated output that serves as input files for BRAGFLO. BRAGFLO uses an outdated list directed I/O standard that allow for space padded fields. When the VMS operating system was upgraded from version 6.x to 7.1 BRAGFLO could not read in certain fields from the PRBRAG generated input files because of extra spaces. The VMS 7.1 I/O standard only allows for 0 padded fields. The script EVAL_BF2_CONVERT_INPUT.COM (written by Mike Williamson) located in CMS Library LIBEVAL removes the spaces so that BRAGFLO can read the input files.

SUMMARIZE	2.20	7/11/1997	Developed	97-016

Minor - There is an index error in subroutine "surfer_print_two_d_grid.for" which causes the data values to be shifted by one position in the SURFER GRID output file. This effectively invalidates this feature of SUMMARIZE. The SURFER GRID feature of SUMMARIZE is for the purpose of outputting a table of two-dimensional data values that can then be read by the plotting package named SURFER. This feature was not used in either the CCA or PAVT calculations or in any of the analysis packages supporting these calculations. This feature is not used by WIPP. This problem will be fixed in the next release of SUMMARIZE. BL Baker, 23 Jul 97.